

20. (New) A method for packaging a semiconductor die, the method comprising the steps of:

attaching a surface of a semiconductor die to a surface of a die carrier having external lead bonds or terminals, such that this die carrier does not extend in front of one or more sensors provided on the top surface of the semiconductor die and one or more bond pads on the top surface of the semiconductor die are coupled to one or more of the bond pads of said die carrier in an annular interface area formed between the top surface of the semiconductor die and a surface of said die carrier;

encapsulating said interface area with a sealing ring; and

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material.

21. (New) The method according to claim 20, further comprising the steps of:

A attaching a top surface of the semiconductor die to a bottom surface of the die carrier such that one or more sensors within the top surface of the semiconductor die are disposed below a first opening in the die carrier that is larger than the one or more sensors but smaller than the semiconductor die, and an interface area is formed between said die and said die carrier where the top surface of the semiconductor die extends beyond the first opening in the die carrier and one or more bond pads on the top surface of the semiconductor die are coupled to one or more of the exterior terminals on the bottom surface of the die carrier;

curing the semiconductor die attached to the die carrier;

encapsulating the interface area with a sealing ring;

curing the sealing ring;

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material; and

curing the packaging material.

22. (New) The method according to claim 21, further comprising the steps of:

encapsulating an exterior portion of the interface area with a first sealing ring;

curing the first sealing ring;

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material;

curing the packaging material;

encapsulating an interior portion of the interface area with a second sealing ring;

and

curing the second sealing ring.

23. (New) The method according to claim 20, further comprising the steps of:

attaching a bottom surface of a semiconductor die to a top surface of a recessed area of a pre-printed frame, the recessed area being larger than the semiconductor die, the semiconductor die having one or more bond pads on a top surface for providing terminals to one or more sensors within the top surface, and the pre-printed frame having one or more wire leads;

curing the semiconductor die attached to the pre-printed frame;

forming a dam to surround the recessed area to prevent a packaging material from entering the recessed area;

curing the dam;

forming wire bonds to couple each bond pad to a portion of one of the wire leads that is near the recessed area;

encapsulating the wire bonds with a sealing ring;

curing the sealing material;

encapsulating the bottom surface of the pre-printed frame with the packaging material;

and

curing the packaging material.

24. (New) The method according to claim 20, further comprising the step of applying a protective coating over the one or more sensors of the semiconductor.

25. (New) The method according to claim 20, further comprising:  
attaching a cap having a second opening larger than the sensors of the semiconductor die, the cap being attached to the top surface of the die carrier; and  
substantially encapsulating the cap with the packaging material.

26. (New) The method according to claim 20, further comprising:  
installing at least one of a lens and a filter in or above a first opening in the die carrier.

27. (New) The method according to claim 20, further comprising:  
installing at least one of a lens and a filter above one or more sensors within the top surface of the semiconductor die.

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(New) A semiconductor die package, comprising:

a semiconductor die having one or more bond pads on a top surface for providing terminals to one or more sensors, in particular optical sensors, within the top surface;

a die carrier which does not extend in front of said sensors and which has one or more bond pads comprising bond terminals and having external lead bonds, the bond pads of said die carrier and the bond pads of said die determining between them an annular interface area and being coupled in this area;

a sealing ring encapsulating said interface area; and

a packaging material encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die.

29. (New) The semiconductor die package according to claim 28, wherein the die carrier has a pre-printed frame and each external terminal comprises a wire lead.

30. (New) The semiconductor die package according to claim 29, further comprising:  
a cap having a second opening similar in size to the first opening, the cap being attached to the top surface of the pre-printed wire frame and the packaging material substantially encapsulating said cap.

31. (New) The semiconductor die package according to claim 30, wherein the cap is attached to the pre-printed frame by a polyimide adhesive.

32. (New) The semiconductor die package according to claim 28, wherein the die

carrier has a first opening larger than the one or more sensors but smaller than the semiconductor die and has one or more external terminals, the top surface of the semiconductor die being attached to the bottom surface of the die carrier such that the one or more sensors are disposed below the first opening and an interface area is formed where the top surface of the semiconductor die extends beyond the first opening in the die carrier and each bond pad is coupled to a portion of one of the external terminals that is exposed on the bottom surface of the die carrier, and the semiconductor die package further comprising:

a sealing ring encapsulating the interface area; and

a packaging material encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die.

33. (New) The semiconductor die package according to claim 32, wherein the sealing ring comprises a first external sealing ring and a second internal sealing ring.

34. (New) The semiconductor die package according to claim 32, wherein said sealing ring and/or said packaging material comprise a thixotropic epoxy-based material.

35. (New) The semiconductor die package according to claim 32, wherein each bond pad is coupled to one of the external pads on the bottom surface of the die carrier by a solder bump.

36. (New) The semiconductor die package according to claim 32, wherein the die carrier comprises a substrate and each external terminal comprises a bond pad formed on a top surface of the substrate.

37. (New) The semiconductor die package according to claim 32, wherein the one or more sensors are covered with a protective layer.

38. (New) The semiconductor die package according to claim 32, further comprising:  
a transparent encapsulation material in the first opening and on the top surface of the semiconductor die.

39. (New) The semiconductor die package according to claim 32, further comprising:  
a lens disposed above the one or more sensors.

40. (New) The semiconductor die package according to claim 28, further comprising:

a pre-printed frame having a recessed area which is larger than the semiconductor die and having one or more wire leads, a bottom surface of the semiconductor die being attached to a top surface of the recessed area of the pre-printed frame;

a wire bond coupling each bond pad to a portion of one of the external terminals near the recessed area;

a dam surrounding the recessed area to prevent packaging material from entering the recessed area;

a sealing material encapsulating each wire bond; and

a package material encapsulating the bottom surface of the pre-printed frame.

41. (New) The semiconductor die package according to claim 40, further comprising:

a cap having a second opening similar in size to the first opening, the cap being attached to the top surface of the pre-printed wire frame and the packaging material substantially encapsulating said cap.

42. (New) The semiconductor die package according to claim 42, wherein the cap is attached to the pre-printed frame by a polyimide adhesive.



43. (New) The semiconductor die package according to claim 40, wherein said sealing ring and/or said packaging material comprise a thixotropic epoxy-based material.

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*Cancel* 44. (New) The semiconductor die package according to claim 40, wherein the one or more sensors are covered with a protective layer.

45. (New) The semiconductor die package according to claim 40, further comprising:  
a transparent encapsulation material in the first opening and on the top surface of the semiconductor die.

46. (New) The semiconductor die package according to claim 40, further comprising:  
a lens disposed above the one or more sensors.

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